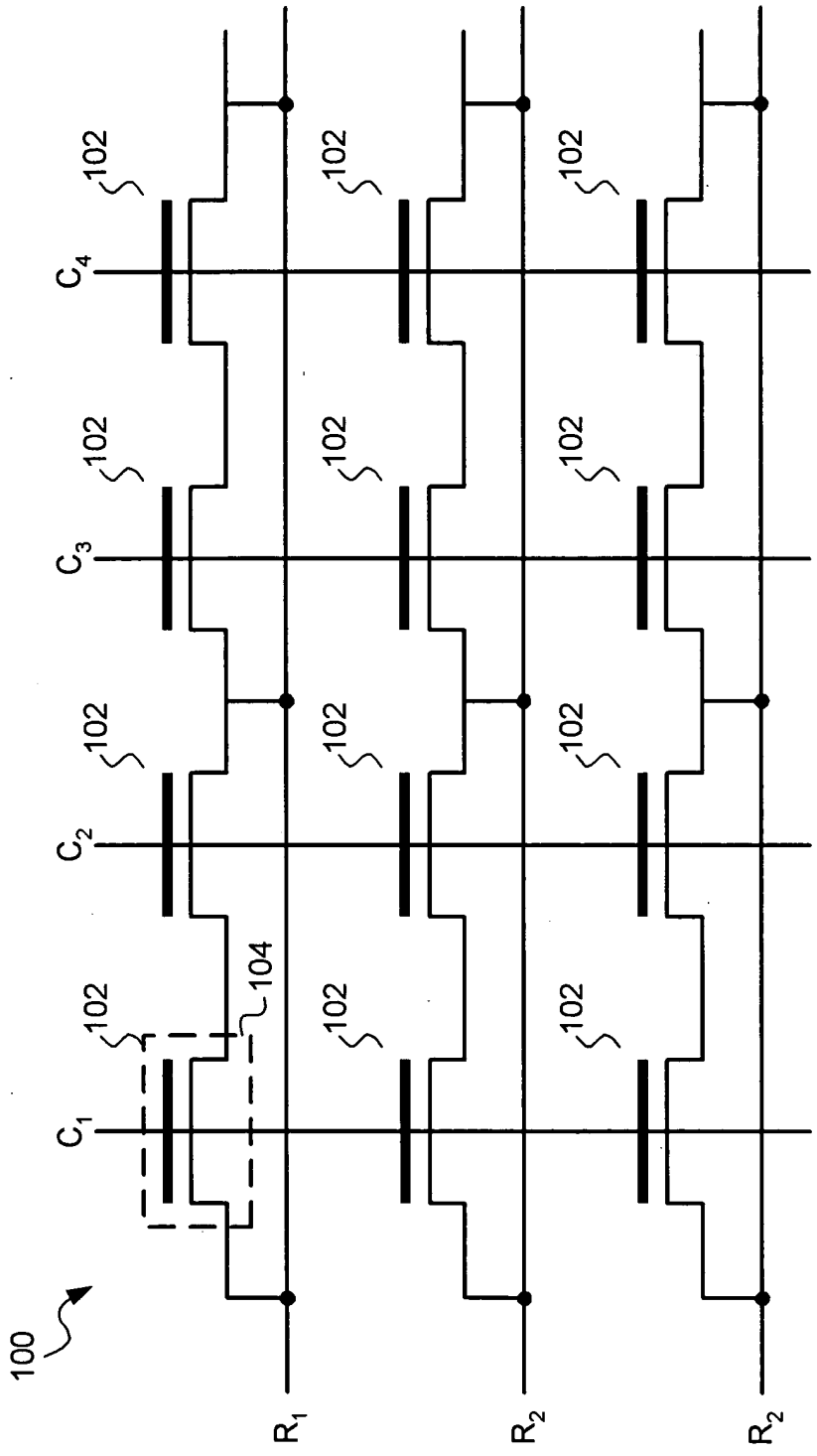

FIGURE 1

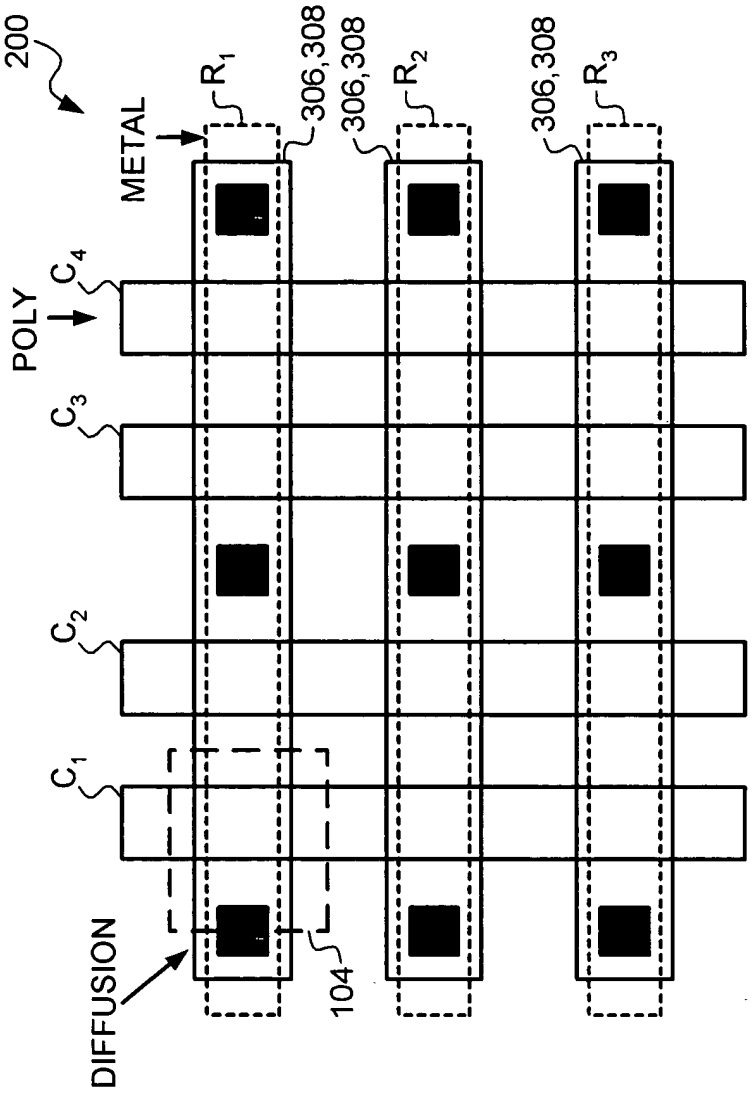
200
METAL
POLY
DIFFUSION
R_1
R_2
R_3
306,308
306,308
306,308
C_4
C_3
C_2
C_1
104

FIGURE 2

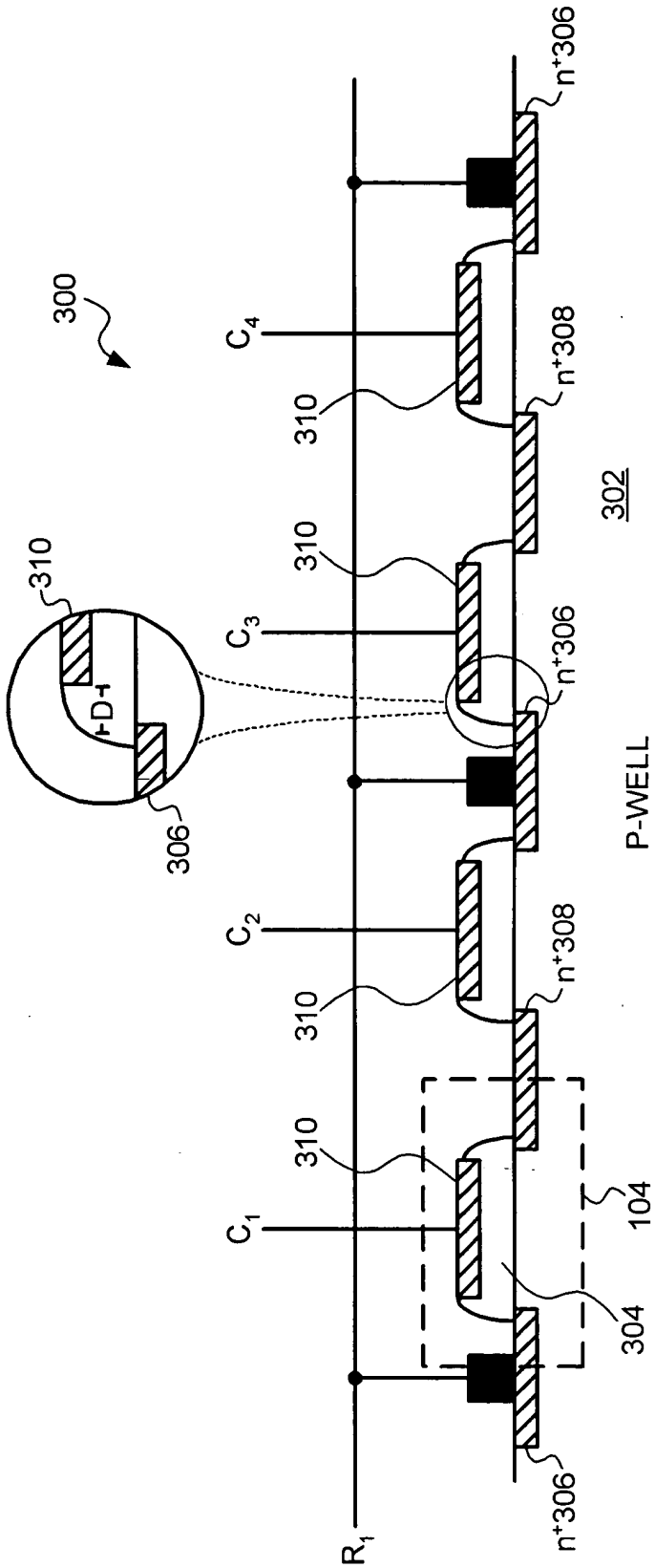
300
310
D
306
C4
C3
C2
C1
R1
310
310
310
310
n+306
n+308
n+306
n+308
n+306
302
P-WELL
104
304

FIGURE 3

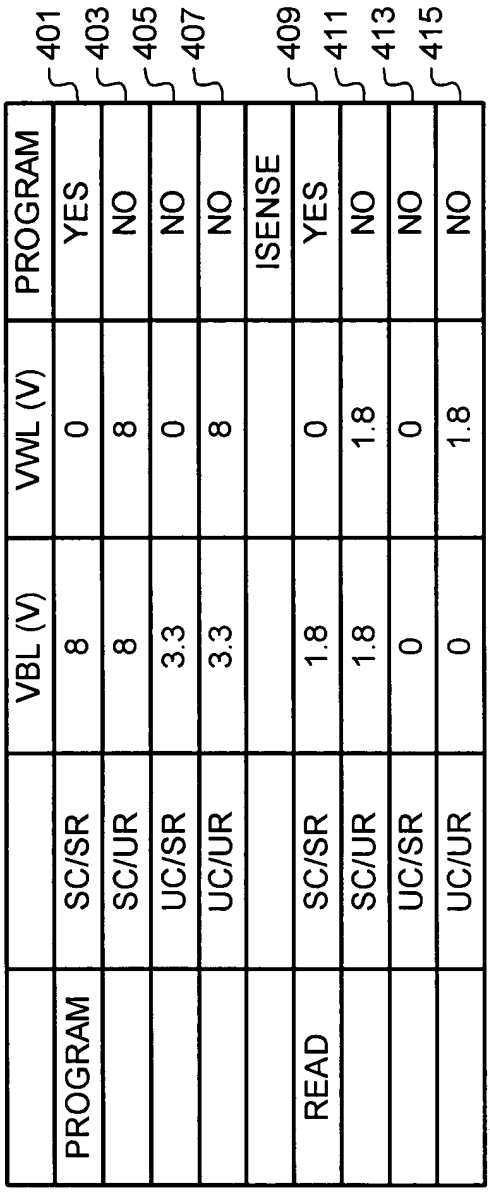
401
403
405
407
409
411
413
415
PROGRAM
SC/SR
VBL (V) 8
VWL (V) 0
PROGRAM YES
SC/UR
8
8
NO
UC/SR
3.3
0
NO
UC/UR
3.3
8
NO
ISENSE
READ
SC/SR
1.8
0
YES
SC/UR
1.8
1.8
NO
UC/SR
0
0
NO
UC/UR
0
1.8
NO

FIGURE 4

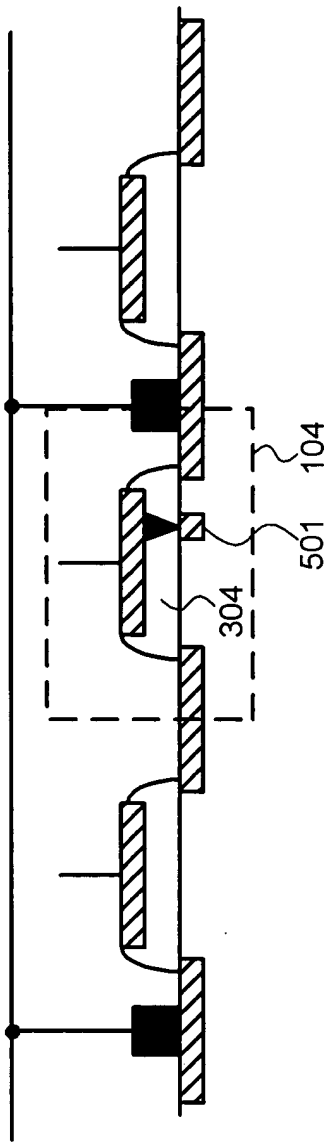

FIGURE 5

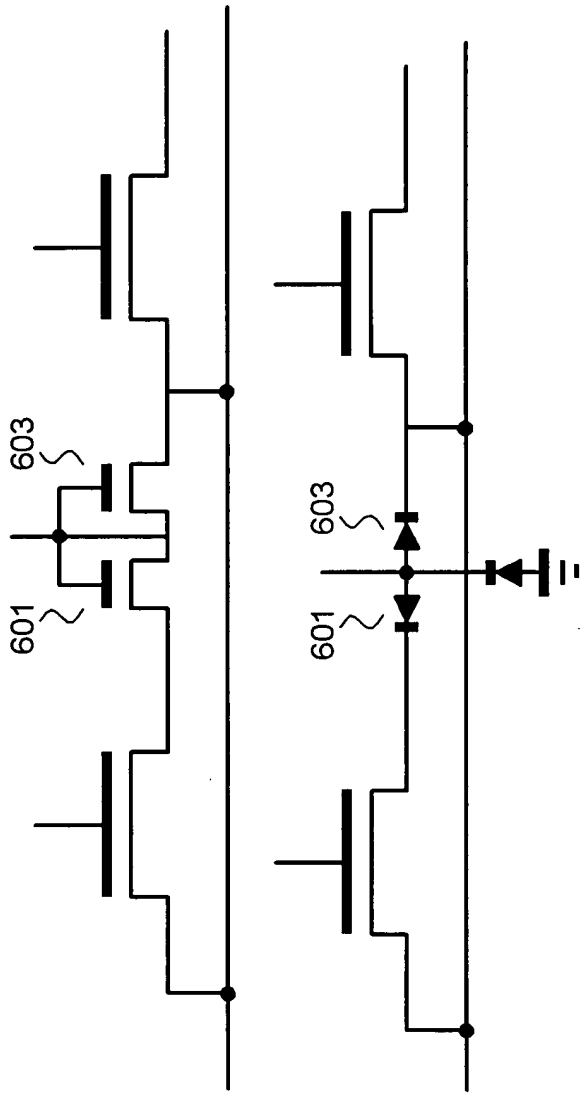

FIGURE 6

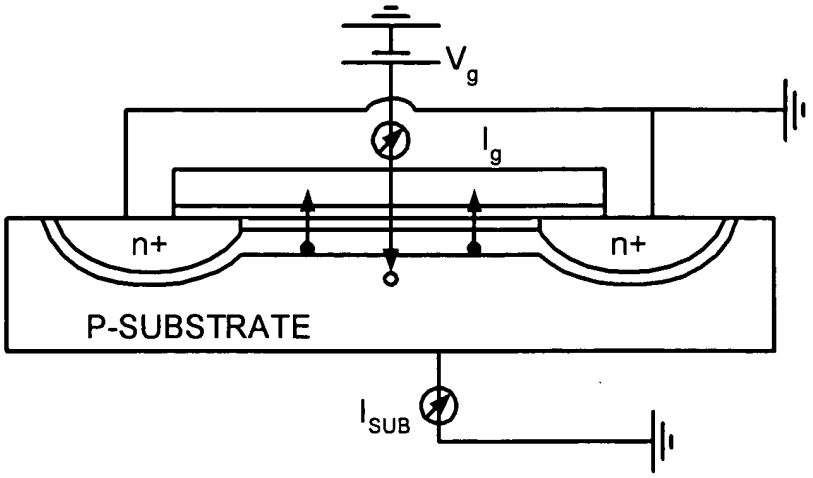

FIGURE 7

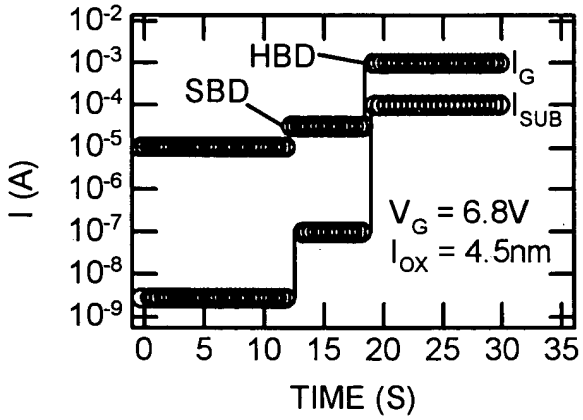

FIGURE 8

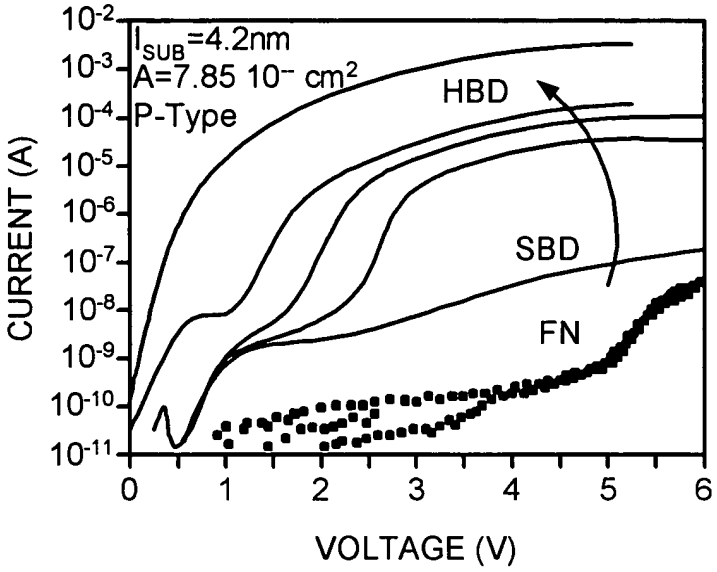
I_{SUB}=4.2nm
A=7.85 10⁻ cm²
P-Type
HBD
SBD
FN
CURRENT (A)
VOLTAGE (V)
10-2
10-3
10-4
10-5
10-6
10-7
10-8
10-9
10-10
10-11
0
1
2
3
4
5
6

FIGURE 9

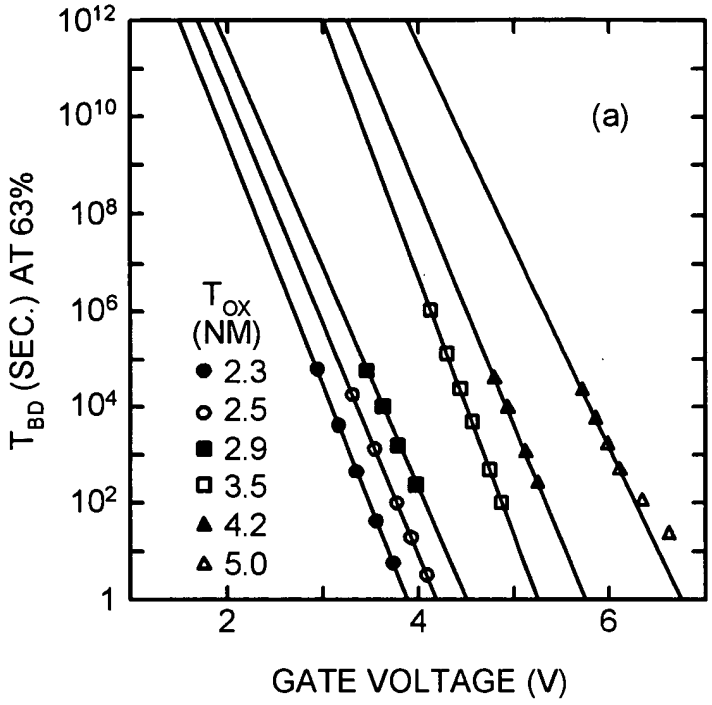
10^{12}
10^{10}
10^{8}
10^{6}
10^{4}
10^{2}
1
T_{BD} (SEC.) AT 63%
(a)
T_{OX} (NM)
2.3
2.5
2.9
3.5
4.2
5.0
2
4
6
GATE VOLTAGE (V)

FIGURE 10

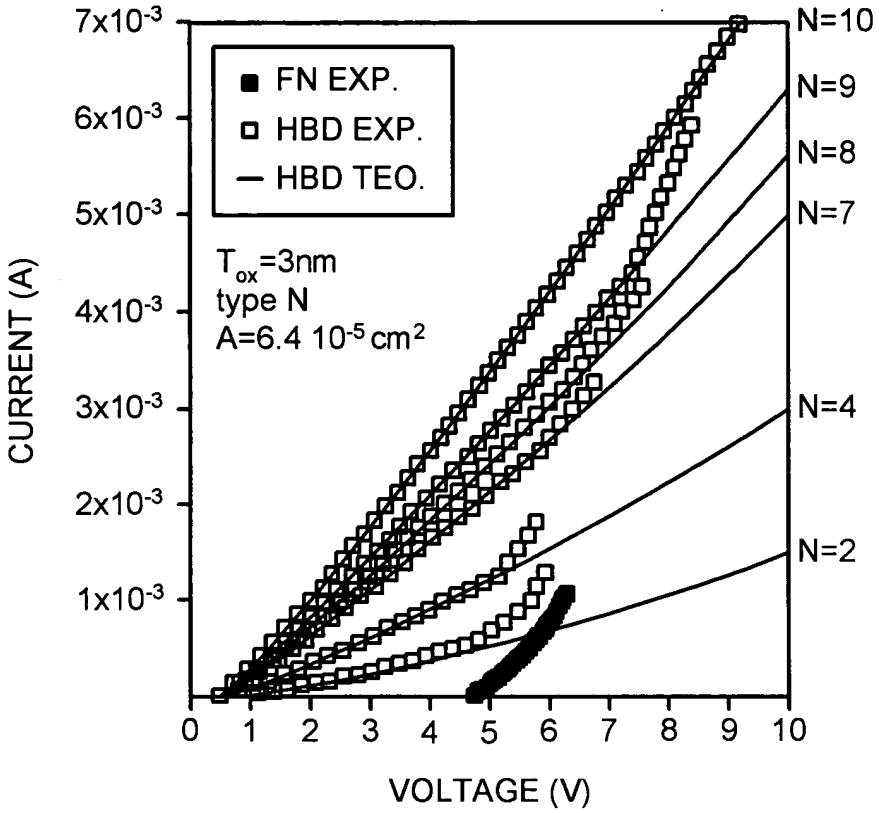
7x10-3
6x10-3
5x10-3
4x10-3
3x10-3
2x10-3
1x10-3
CURRENT (A)
FN EXP.
HBD EXP.
HBD TEO.
Tox=3nm
type N
A=6.4 10-5 cm2
N=10
N=9
N=8
N=7
N=4
N=2
0 1 2 3 4 5 6 7 8 9 10
VOLTAGE (V)

FIGURE 11

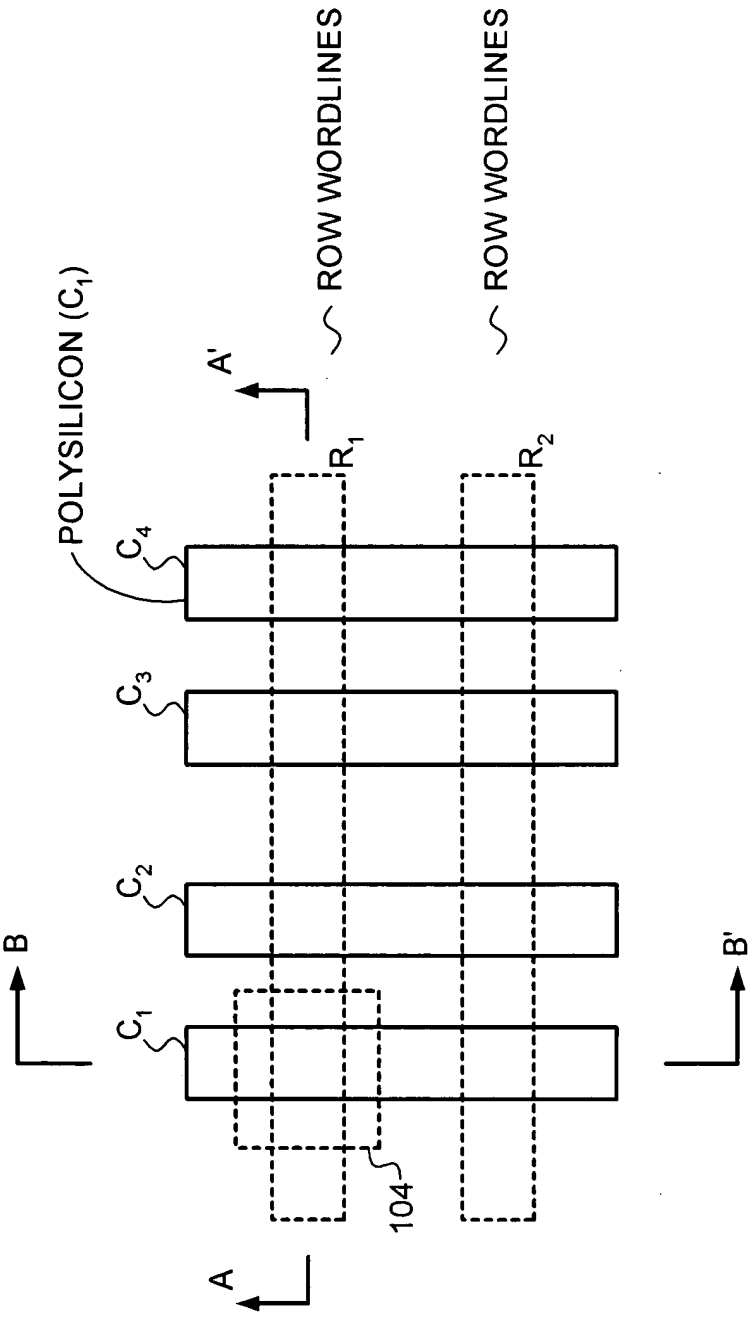
POLYSILICON (C_1)
ROW WORDLINES
ROW WORDLINES
A'
A
B
B'
R_1
R_2
C_1
C_2
C_3
C_4
104

FIGURE 12

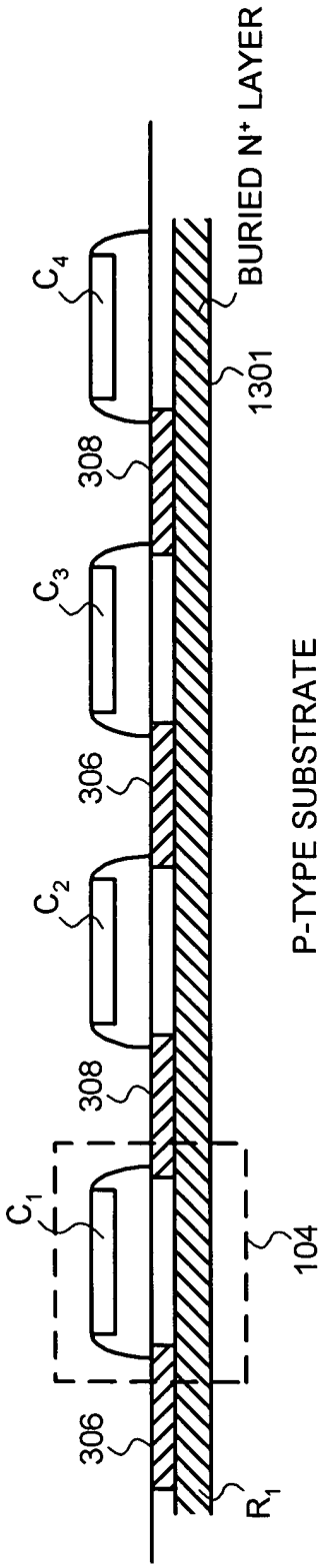
BURIED N+ LAYER
C4
C3
C2
C1
1301
308
306
308
306
104
R1
P-TYPE SUBSTRATE

FIGURE 13

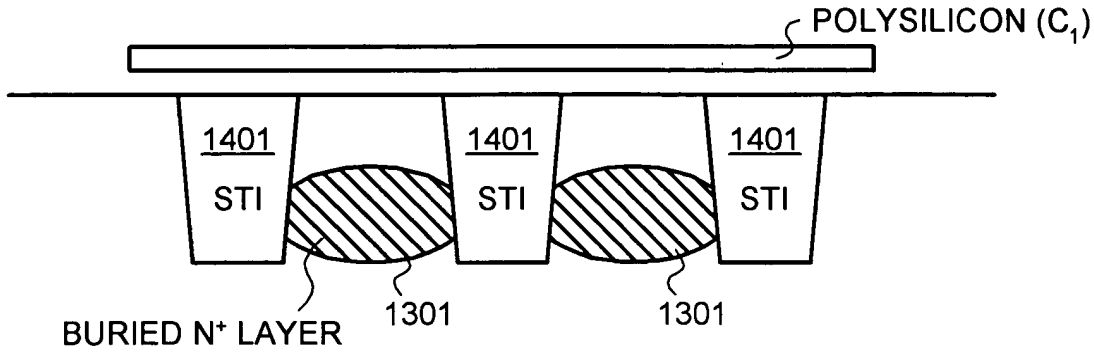
POLYSILICON (C_1)
1401
STI
1401
STI
1401
STI
BURIED N+ LAYER
1301
1301

FIGURE 14

		VBL (V)	VWL (V)	PROGRAM	
PROGRAM	SC/SR	V_{PP}	0	YES	401
	SC/UR	V_{PP}	FLOATING	NO	403
	UC/SR	< 0.5 V	0	NO	405
	UC/UR	< 0.5 V	FLOATING	NO	407
				I_{SENSE}	409
READ	SC/SR	V_{DD} OR V_{CC}	0	YES	411
	SC/UR	V_{DD} OR V_{CC}	V_{DD} OR V_{CC}	NO	413
	UC/SR	0 OR FLOAT	0	NO	415
	UC/UR	0 OR FLOAT	V_{DD} OR V_{CC}	NO	

FIGURE 15

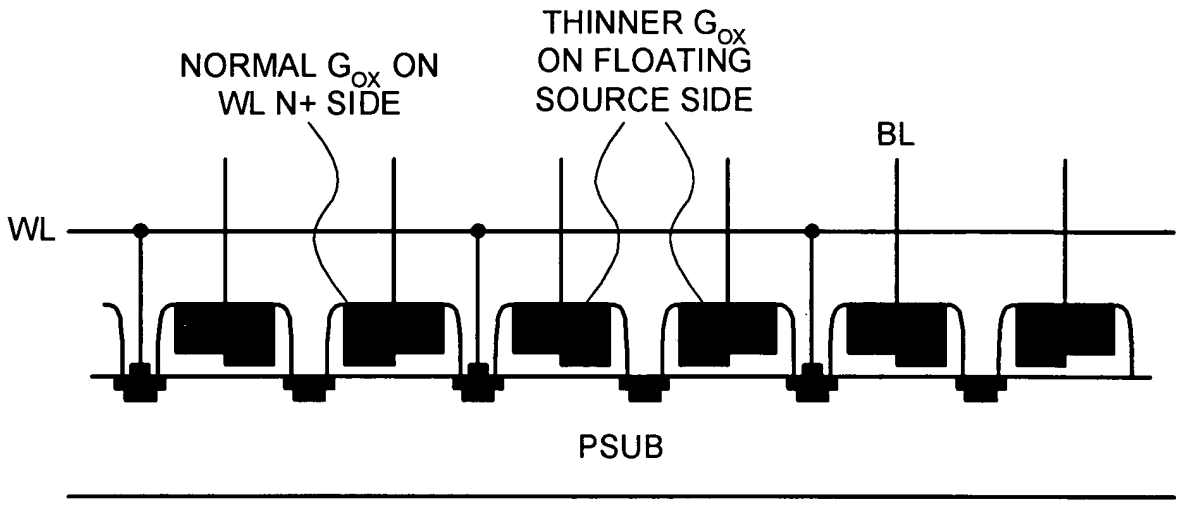

FIGURE 16

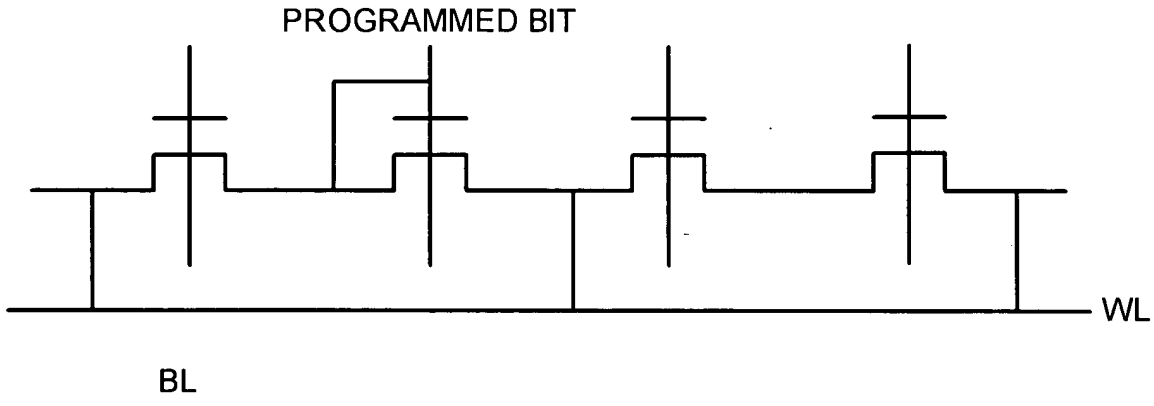

FIGURE 17

0.18um/0.13um XPM CX CELL OPERATION

		VBL (V)	VWL (V)	PROGRAM
PROGRAM	SB/SW	V_{PP}	0	YES
	SB/UW	V_{PP}	PC TO $V_{PP}/2$ AND FL	NO
	UB/SW	< 0.5 V	0	NO
	UB/UW	< 0.5 V	PC TO $V_{PP}/2$ AND FL	NO
				I_{SENSE}
READ	SB/SW	V_{DD} OR V_{CC}	0	YES
	SB/UW	V_{DD} OR V_{CC}	V_{DD} OR V_{CC}	NO
	UB/SW	0	0	NO
	UB/UW	0	V_{DD} OR V_{CC}	NO

V_{PP} = 8~9V FOR G_{OX}=32A (0.18um) OR 5-7 FOR G_{OX}=20A, OR 3~4.5 V FOR 10-15A (5 TO 10A THINNER THAN NORMAL STANDARD GATE OXIDE).
V_{DD} = I/O VOLTAGE 3.3V OR 2.5V
V_{CC} = 1.8V FOR 0.18um AND 1.2V FOR 0.13um

FIGURE 18

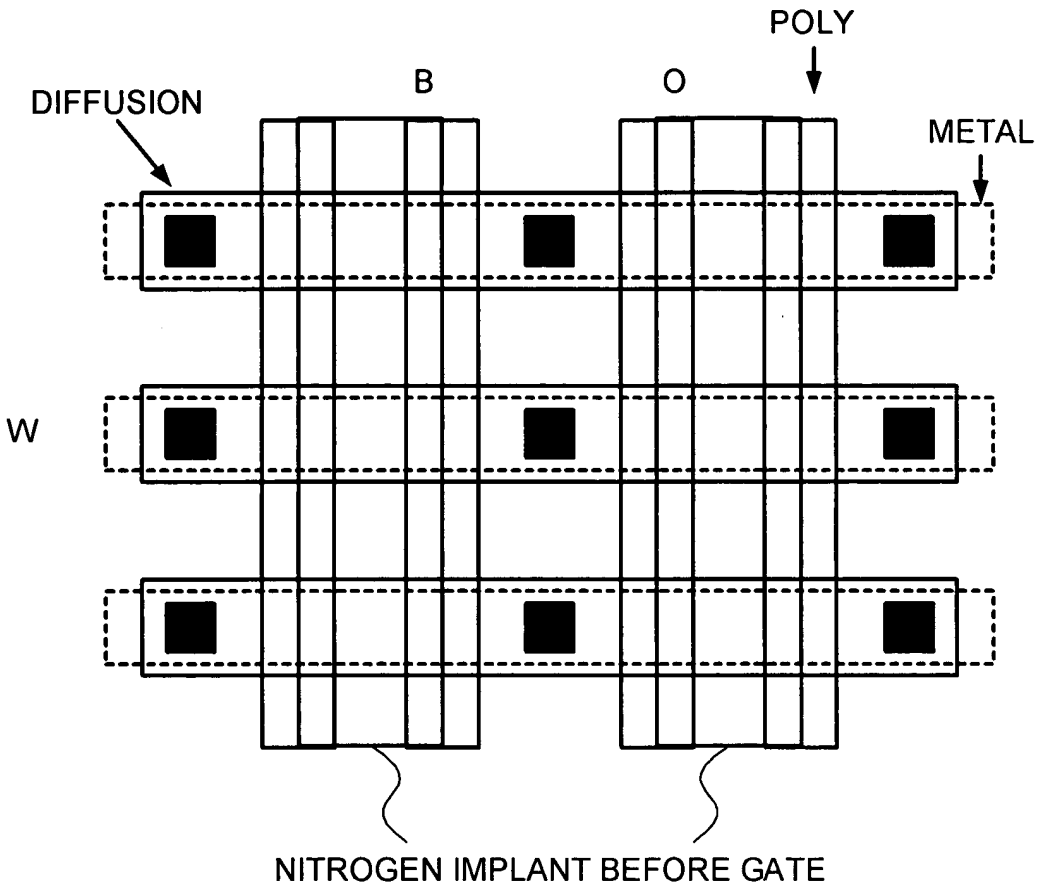

FIGURE 19

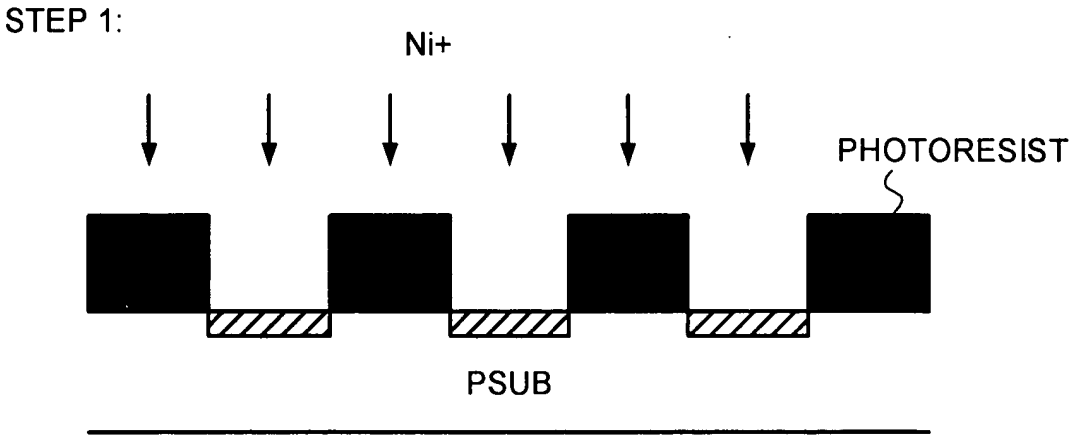

FIGURE 20

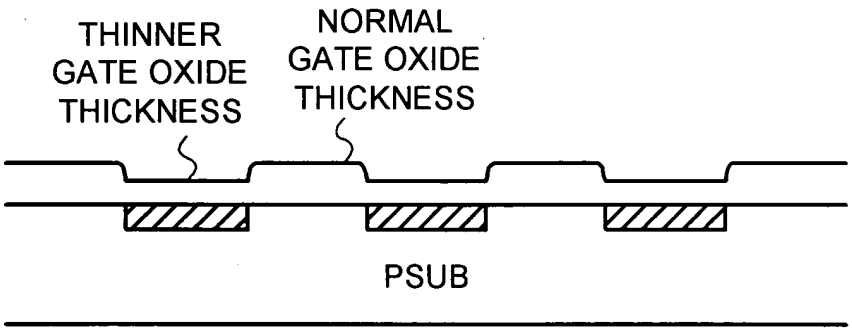

FIGURE 21

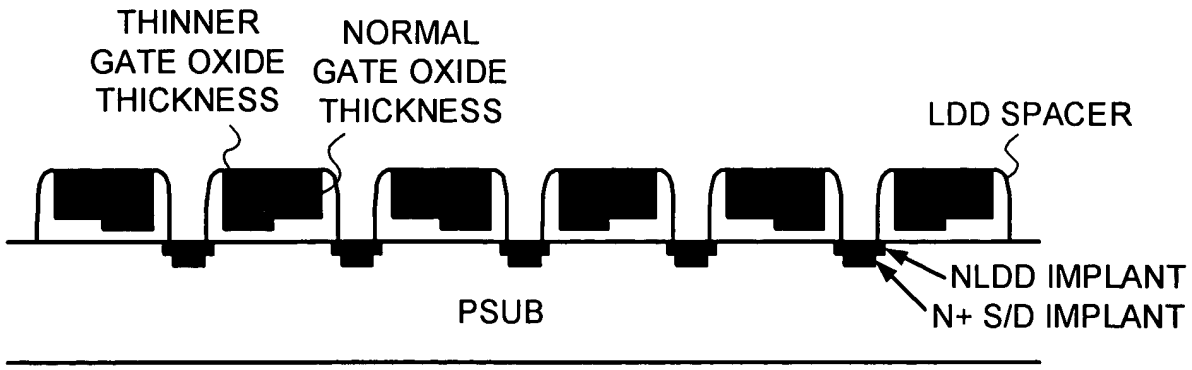

FIGURE 22

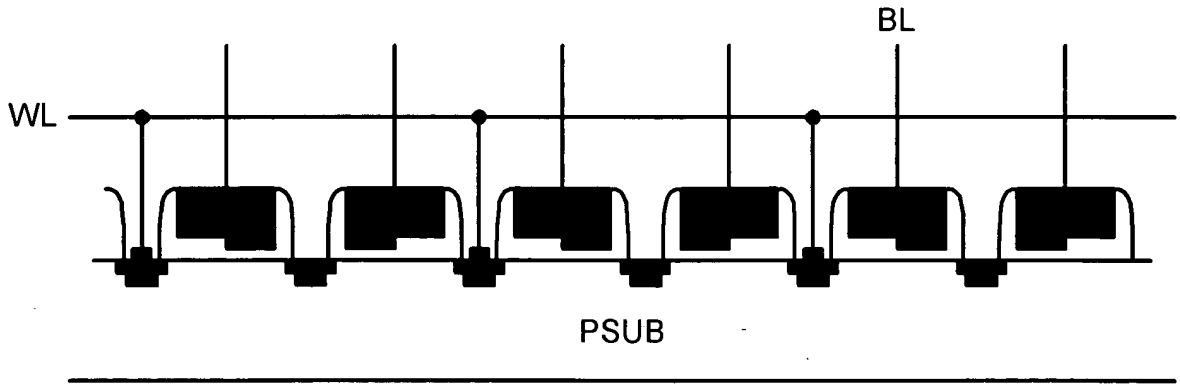

FIGURE 23

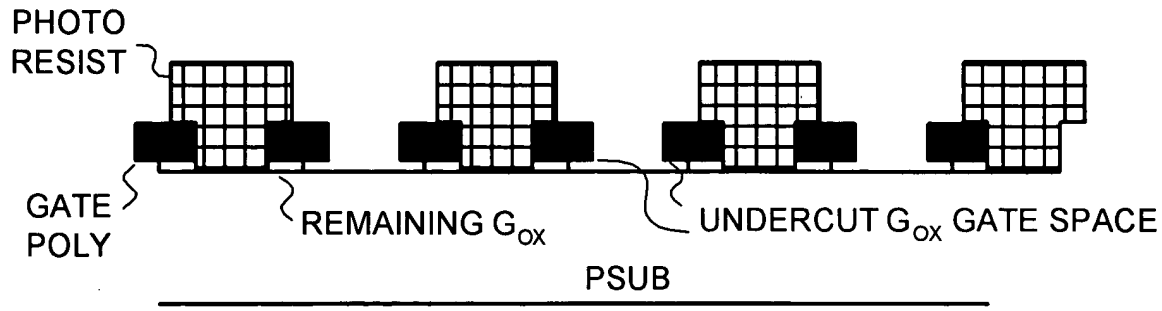

FIGURE 24

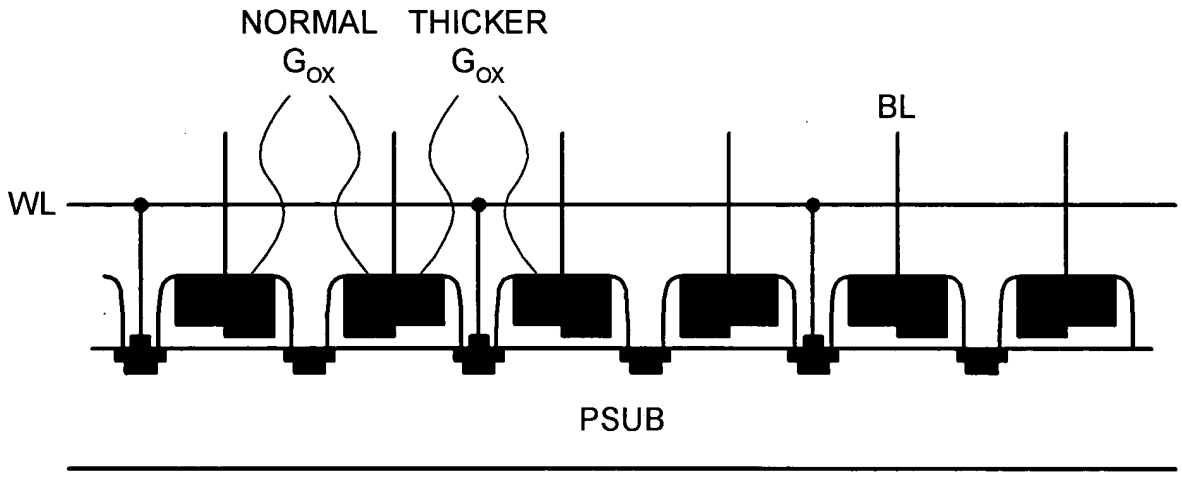

FIGURE 25

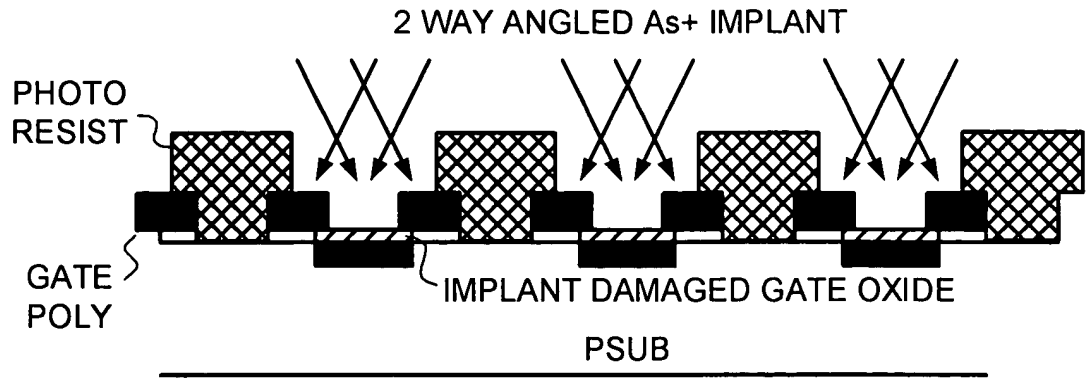

FIGURE 26

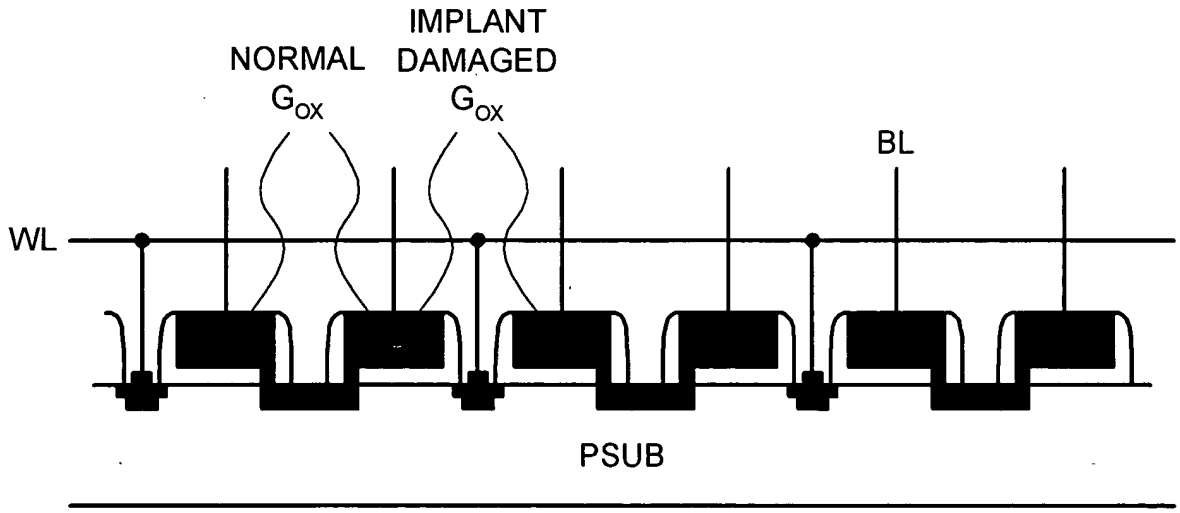

FIGURE 27

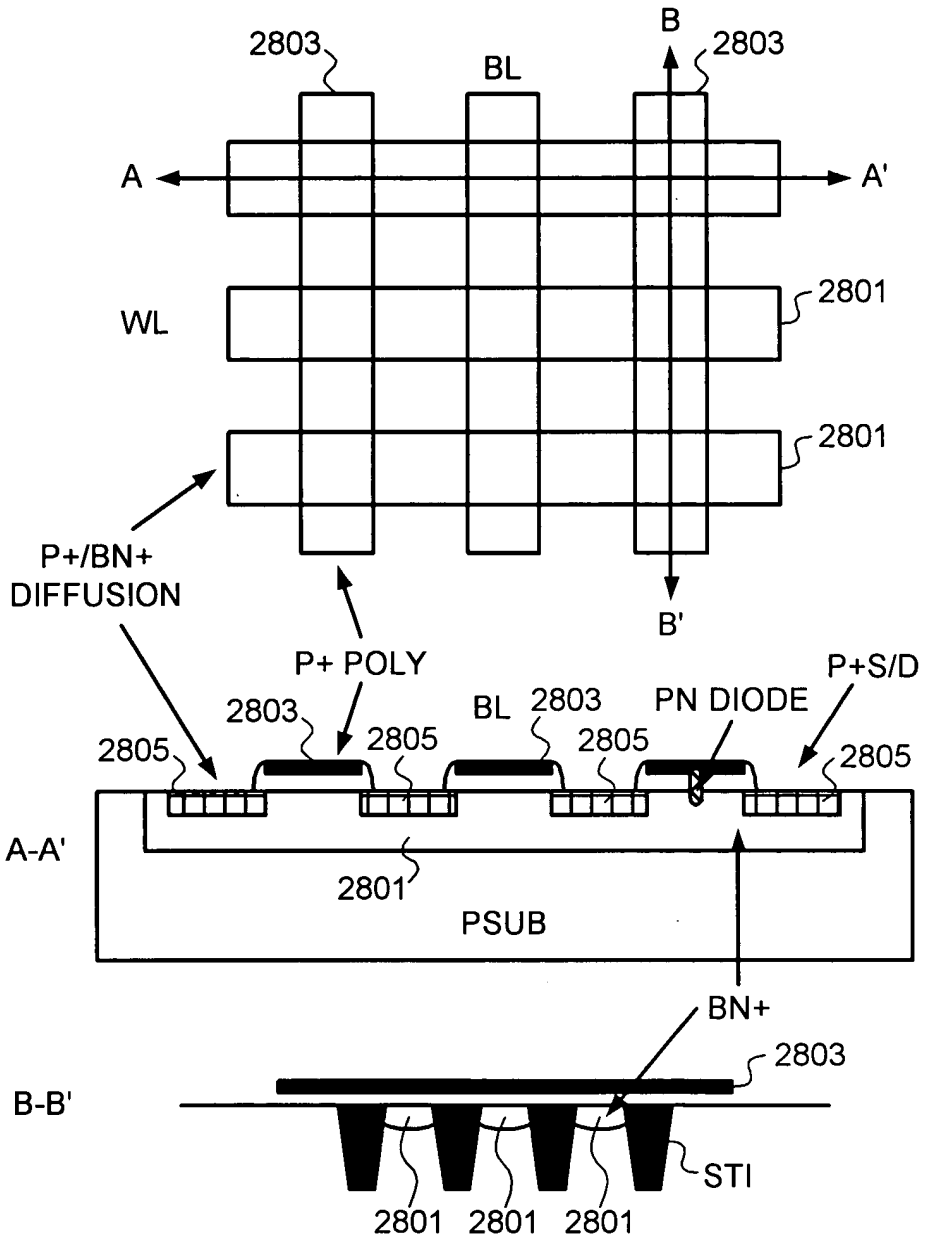
2803
BL
B
2803
A
A'
WL
2801
2801
P+/BN+
DIFFUSION
B'
P+ POLY
P+S/D
2803
BL
2803
PN DIODE
2805
2805
2805
2805
A-A'
2801
PSUB
BN+
2803
B-B'
STI
2801
2801
2801

FIGURE 28

XPM P+POLY/BN+ 1T CELL OPERATION

		VBL (V)(P+POLY)	VWL (V)(BN+DIFFUSION)	PROGRAM
PROGRAM	SC/SR	V_{BP}	V_{WP}	YES
	SC/UR	V_{BP}	FLOATING	NO
	UC/SR	< 0.5 V	V_{WP}	NO
	UC/UR	< 0.5 V	FLOATING	NO
				I_{SENSE}
READ	SC/SR	V_{RD}	0	YES
	SC/UR	V_{RD}	V_{RD}	NO
	UC/SR	0	0	NO
	UC/UR	0	V_{RD}	NO

FIGURE 29

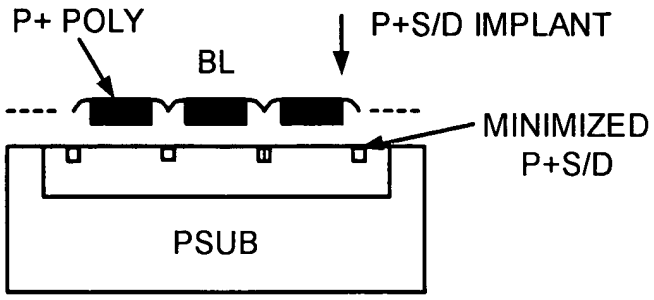

FIGURE 28A

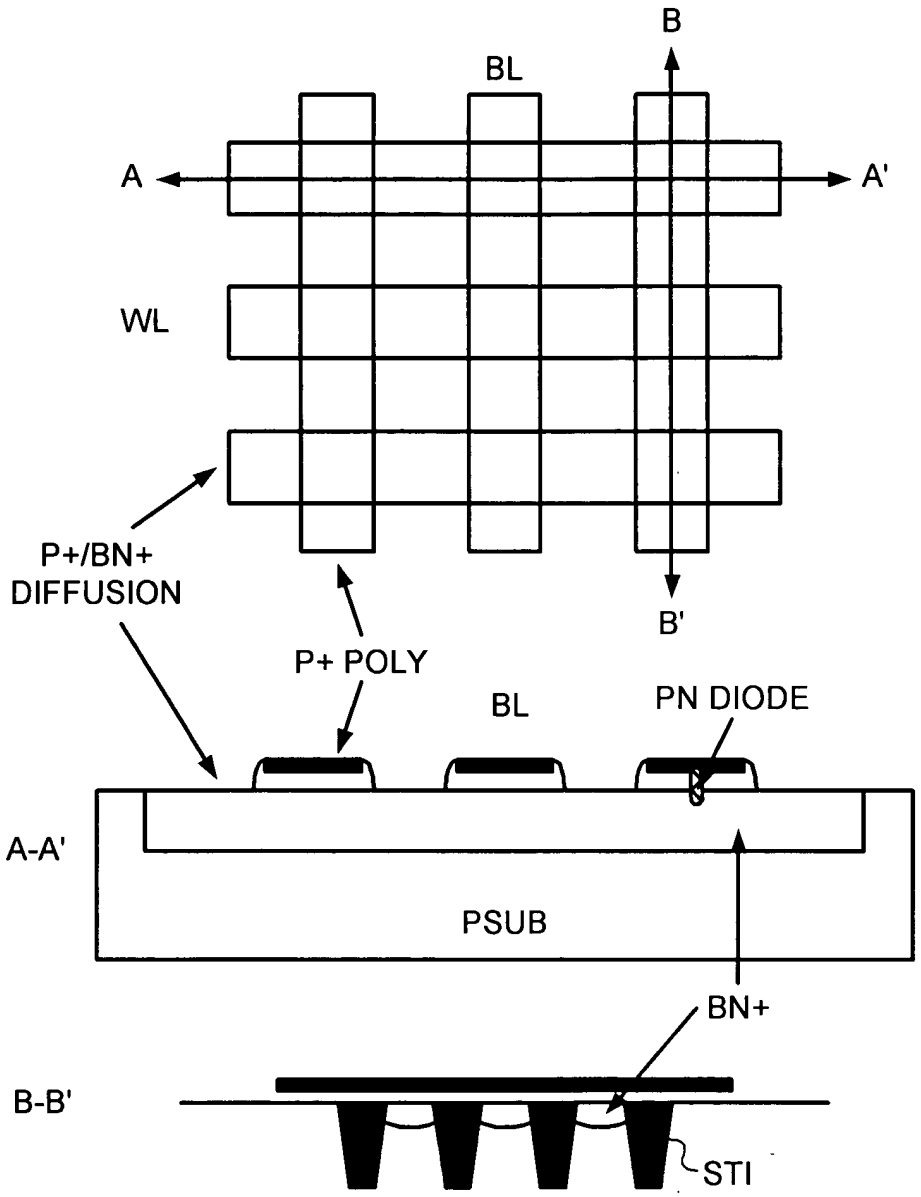

FIGURE 30

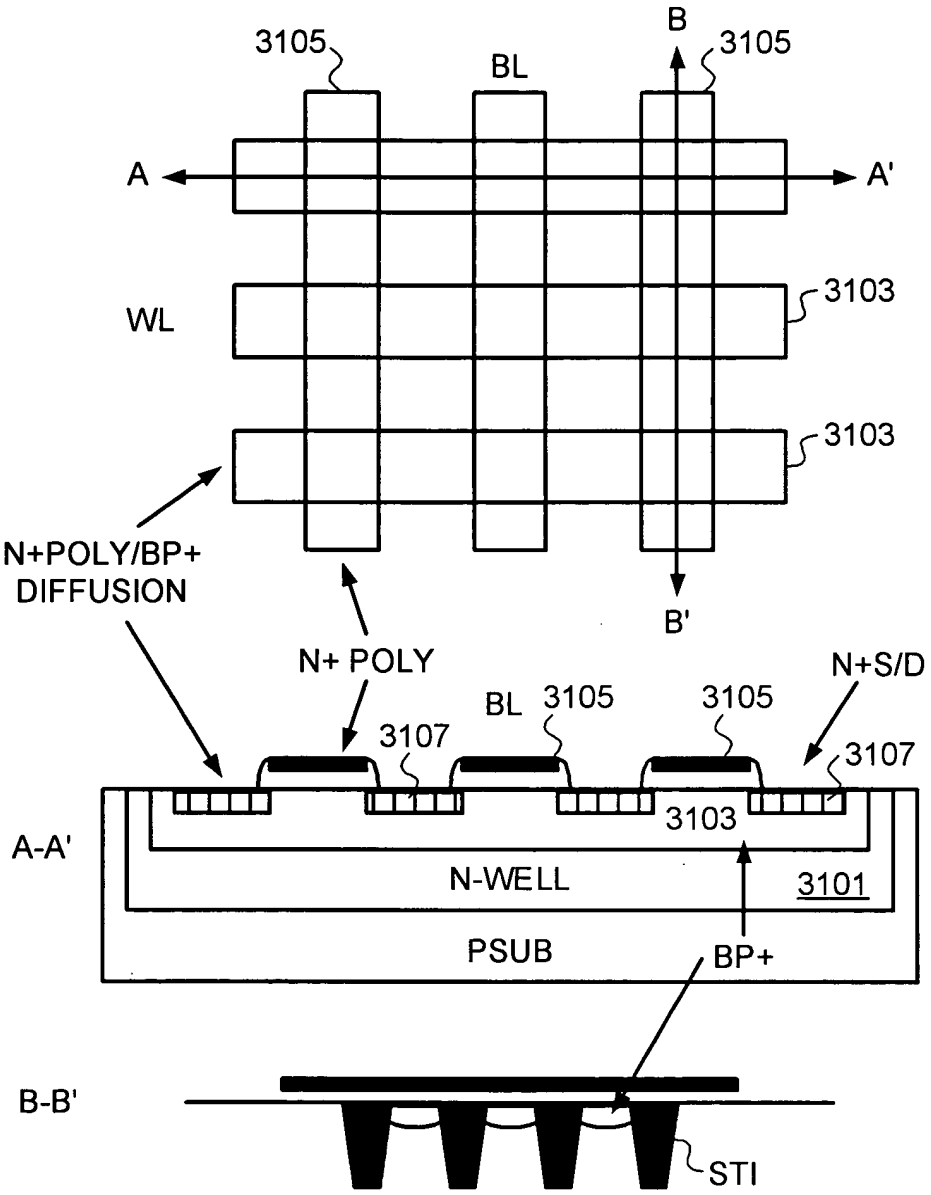
3105
BL
B
3105
A
A'
WL
3103
3103
N+POLY/BP+
DIFFUSION
B'
N+ POLY
N+S/D
BL
3105
3105
3107
3107
3103
A-A'
N-WELL
3101
PSUB
BP+
B-B'
STI

FIGURE 31

XPM N+POLY/BP+ 1T CELL OPERATION

		VBL (V)(N+POLY)	VWL (V)(BP+)	N-	PROGRAM
PROGRAM	SC/SR	V_{BP}	V_{WP}	V_{WP}	YES
	SC/UR	V_{BP}	FLOATING	V_{WP}	NO
	UC/SR	(0 ~ -	V_{WP}	V_{WP}	NO
	UC/UR	(0 ~ -	FLOATING	V_{WP}	NO
					I_{SENSE}
READ	SC/SR	0	V_{RD}	V_{DD} OR V_{RD}	YES
	SC/UR	0	0	V_{DD} OR V_{RD}	NO
	UC/SR	V_{RD}	V_{RD}	V_{DD} OR V_{RD}	NO
	UC/UR	V_{RD}	0	V_{DD} OR V_{RD}	NO

FIGURE 32

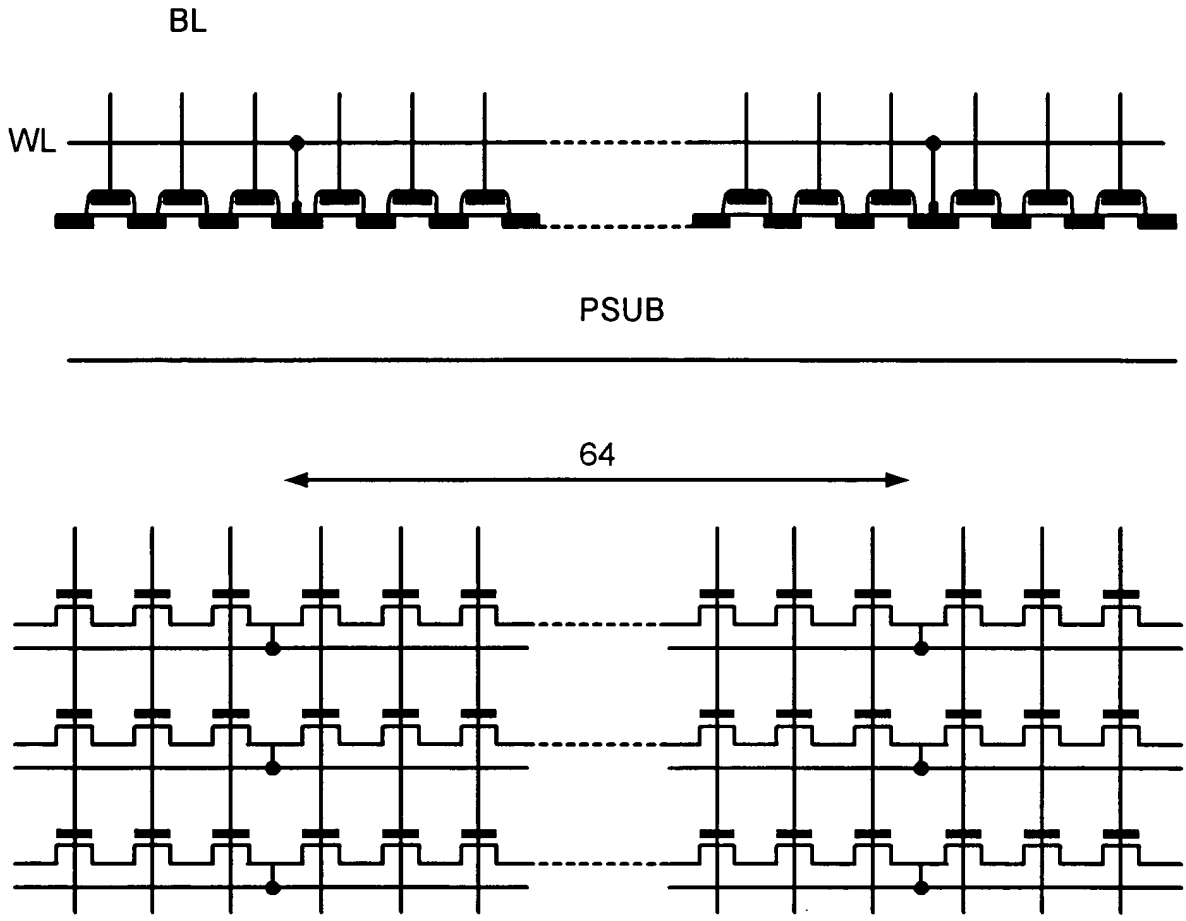

FIGURE 33